

REMARKS

Claims 1-29 are pending in this application. Claims 9, 13, 17, and 20 are amended herein. Claims 25-29 are added herein. Support for the amendments to the claims may be found in the claims as originally filed. Reconsideration is requested based on the foregoing amendment and the following remarks.

Objections to the Claims:

Claims 9 and 13 were objected to for various informalities. Claims 9 and 13 were amended in substantial accord with the Examiner's suggestions. The Examiner's suggestions are appreciated. Withdrawal of the objection is earnestly solicited.

Claim Rejections - 35 U.S.C. § 103:

Claims 1, 2, 3, and 5-15 were rejected under 35 U.S.C. § 103(a) as being unpatentable over WIPO Publication No. W099/49504 to Fukami (hereinafter "Fukami") in view of U.S. Patent No. 6,437,851 to Hagiwara (hereinafter "Hagiwara"). The rejection is traversed. Reconsideration is earnestly solicited.

The third clause of claim 1 recites:

A timer that measures the time that has elapsed since the supply of the liquid by the liquid supply mechanism was started.

Fukami neither teaches, discloses, nor suggests "a timer that measures the time that has elapsed since the supply of the liquid by the liquid supply mechanism was started," as recited in claim 1. Fukami, in fact, has no use for a timer, because Fukami keeps the liquid (7) filled between the projection optical system (PL) and the wafer (W). In particular, as described in the Abstract:

A projection exposure method capable of keeping a liquid (7) filled between a projection optical system (PL) and a wafer (W) even while the wafer (W) is being moved when a liquid immersion method is used to conduct an exposure, wherein a discharge nozzle (21a) and inflow nozzles (23a, 23b) are disposed so as to hold a lens (4) at the tip end of the projection optical system (PL) in an X direction.

Since Fukami keeps the liquid (7) filled between the projection optical system (PL) and the wafer (W), Fukami has no use for "a timer that measures the time that has elapsed since the supply of the liquid by the liquid supply mechanism was started," as recited in claim 1.

The supply amount and recovery amount of the liquid (7) of Fukami, moreover, is regulated according to a moving speed of the wafer (W), not “the time that has elapsed since the supply of the liquid by the liquid supply mechanism was started,” as recited in claim 1. In particular, as described in the Abstract:

When the wafer (W) is moved in a -X direction by an XY stage (10), a liquid (7) controlled to a preset temperature is supplied from a liquid supply device (5) via a supply pipe (21) and the discharge nozzle (21a) so as to fill the portion between the lens (4) and the surface of the wafer (W) and the liquid (7) is recovered from the surface of the wafer (W) by a liquid supply device (6) via a recovery pipe (23) and the inflow nozzles (23a, 23b), the supply amount and recovery amount of the liquid (7) being regulated according to a moving speed of the wafer (W).

Since the supply amount and recovery amount of the liquid (7) of Fukami is regulated according to a moving speed of the wafer (W), Fukami has no use for “a timer that measures the time that has elapsed since the supply of the liquid by the liquid supply mechanism was started,” as recited in claim 1.

The Office Action acknowledges graciously in section 4, at page 3 that Fukami shows no timer that measures the time that has elapsed since the supply of the liquid by the liquid supply mechanism was started, and attempts to compensate for the deficiency of Fukami by combining Fukami with Hagiwara. Hagiwara, however, shows no “timer that measures the time that has elapsed since the supply of the liquid by the liquid supply mechanism was started” either, and thus cannot make up for the deficiencies of Fukami with respect to claim 1 in any case.

Hagiwara, rather, uses the timer to control the *rate* of flow, not to measure “the time that has elapsed since the supply of the liquid by the liquid supply mechanism was started,” as recited in claim 1. In particular, as described at column 11, lines 17-21:

The control system could be simplified by omitting the collecting funnel 23 and the sensors 20 and 24, and instead using a timer etc. to intermittently supply pure water from the supply piping 21. For example, pure water may be supplied in the order of one liter at a time per hour.

Since Hagiwara uses a timer to measure a rate of flow, Hagiwara shows no “timer that measures the time that has elapsed since the supply of the liquid by the liquid supply mechanism was started” either, and thus cannot make up for the deficiencies of Fukami with respect to claim 1 in any case. Thus, even if Fukami and Hagiwara were combined as proposed in the Office Action, claim 1 would not result.

Fukami, moreover, needs no timer in the first place, as discussed above, since Fukami keeps the liquid (7) filled between the projection optical system (PL) and the wafer (W). It is submitted, therefore, that persons of ordinary skill in the art at the time the invention was made would not have modified Fukami as proposed in the Office Action, since it would have served no purpose.

The fourth clause of claim 1 recites:

A control apparatus that determines, based on a measurement result of the timer, whether a space, which is between the image plane side tip part of the projection optical system and the object and includes at least an optical path of the exposure light, is filled with the liquid.

Fukami neither teaches, discloses, nor suggests “a control apparatus that determines, based on a measurement result of the timer, whether a space, which is between the image plane side tip part of the projection optical system and the object and includes at least an optical path of the exposure light, is filled with the liquid,” as recited in claim 1. Fukami, in fact, *keeps* the liquid (7) filled between the projection optical system (PL) and the wafer (W), as discussed above, and so has no interest in determining “whether a space, which is between the image plane side tip part of the projection optical system and the object and includes at least an optical path of the exposure light, is filled with the liquid,” as recited in claim 1.

The Office Action acknowledges graciously in section 4, in the second full paragraph at page 3 that Fukami does not specifically teach a control apparatus that determines based on a measurement result of the timer. The Office Action seeks to compensate for this deficiency of Fukami by combining Fukami with Hagiwara. Hagiwara, however, is not determining “based on a measurement result of the timer, whether a space, which is between the image plane side tip part of the projection optical system and the object and includes at least an optical path of the exposure light, is filled with the liquid” either, and thus cannot make up for the deficiencies of Fukami with respect to claim 1 in any case. Hagiwara, rather, is using a timer to measure a *rate* of flow, as discussed above, not determining “whether a space, which is between the image plane side tip part of the projection optical system and the object and includes at least an optical path of the exposure light, is filled with the liquid,” as recited in claim 1. Thus, even if Fukami and Hagiwara were combined as proposed in the Office Action, claim 1 would not result.

The Office Action, in any case, asserts in section 4, at the top of page 4, that:

Thus, it would have been obvious, to one of ordinary skill in the art, at time the

invention was made, to arrive at a timer that measures the time that has elapsed since the supply of the liquid by the liquid supply mechanism was started and a control apparatus that determines, based on a measurement result of the timer so that when a space, which is between the image plane side tip part of the projection optical system and the object and includes at least an optical path of the exposure light, is filled with the liquid the exposure wavelength is essentially shorten and the depth of focus widen which produce a better image transfer.

Fukami, however, already keeps the liquid (7) filled between the projection optical system (PL) and the wafer (W), as discussed above. Adding *more* liquid would not shorten the depth of focus of Fukami any further. Consequently, Fukami has no interest in determining "whether a space, which is between the image plane side tip part of the projection optical system and the object and includes at least an optical path of the exposure light, is filled with the liquid," as recited in claim 1. It is submitted, therefore, that persons of ordinary skill in the art at the time the invention was made would not have modified Fukami as proposed in the Office Action, since it would have served no purpose. Claim 1 is submitted to be allowable. Withdrawal of the rejection of claim 1 is earnestly solicited.

Claims 2, 3, and 5 depend from claim 1 and add additional distinguishing elements. Claims 2, 3, and 5 are thus also submitted to be allowable. Withdrawal of the rejection of claims 2, 3, and 5 is earnestly solicited.

Claims 6, 7, and 8:

The third clause of claim 6 recites:

A timer that measures the time that has elapsed since the supply of the liquid by the liquid supply mechanism was stopped;

Neither Fukami nor Hagiwara teaches, discloses, or suggests "a timer that measures the time that has elapsed since the supply of the liquid by the liquid supply mechanism was stopped," as discussed above with respect to the rejection of claim 1.

The fifth clause of claim 6 recites:

A control apparatus that determines, based on a measurement result of the timer, whether the liquid has been recovered from the space between the image plane side tip part of the projection optical system and the object.

Neither Fukami nor Hagiwara teaches, discloses, or suggests "a control apparatus that determines, based on a measurement result of the timer, whether the liquid has been recovered from the space between the image plane side tip part of the projection optical system and the

object," as discussed above with respect to the rejection of claim 1. Thus, even if Fukami and Hagiwara were combined as proposed in the Office Action, claim 6 would not result. Claim 6 is the submitted to be allowable, for at least those reasons discussed above with respect to the rejection of claim 1. Withdrawal of the rejection of claim 6 is earnestly solicited.

Claims 7 and 8 depend from claim 6 and add further distinguishing elements. Claims 7 and 8 are thus also submitted to be allowable. Withdrawal of the rejection of claims 7 and 8 is earnestly solicited.

Claims 9-12:

The last clause of claim 9 recites:

A control apparatus that determines, based on the measurement results of the first measuring instrument and the second measuring instrument, whether a space, which is between the image plane side tip part of the projection optical system and an object opposing the tip part and includes at least an optical path of the exposure light, is filled with the liquid.

Neither Fukami nor Hagiwara teaches, discloses, or suggests "a control apparatus that determines, based on the measurement results of the first measuring instrument and the second measuring instrument, whether a space, which is between the image plane side tip part of the projection optical system and an object opposing the tip part and includes at least an optical path of the exposure light, is filled with the liquid," as discussed above with respect to the rejection of claim 1. Fukami, rather, *keeps* the liquid (7) filled between the projection optical system (PL) and the wafer (W).

The Office Action acknowledges graciously in section 4, at page 6, that Fukami shows no "control apparatus that determines, based on the measurement results of the first measuring instrument and the second measuring instrument, whether a space, which is between the image plane side tip part of the projection optical system and an object opposing the tip part and includes at least an optical path of the exposure light, is filled with the liquid," and attempts to compensate for this deficiency of Fukami by combining Fukami with Hagiwara.

Hagiwara, however, has no "control apparatus that determines, based on the measurement results of the first measuring instrument and the second measuring instrument, whether a space, which is between the image plane side tip part of the projection optical system and an object opposing the tip part and includes at least an optical path of the exposure light, is filled with the liquid" either, and thus cannot make up for the deficiencies of Fukami with respect

to claim 9 in any case. Hagiwara, rather, uses the timer to control the *rate* of flow, not to measure "whether a space, which is between the image plane side tip part of the projection optical system and an object opposing the tip part and includes at least an optical path of the exposure light, is filled with the liquid," as discussed above with respect to the rejection of claim 1.

Nor is the solenoid valve 22 of Hagiwara monitoring the flow either, contrary to the assertion in the Office Action. The solenoid valve 22, rather, is for *adjusting* the supply flow rate of the pure water. In particular, as described at column 10, lines 57 and 58:

The piping 21 has a solenoid valve 22 for adjusting the supply flow rate of the pure water through the piping 21.

Since the solenoid valve 22 of Hagiwara is for adjusting the supply flow rate of the pure water, Hagiwara has no "control apparatus that determines, based on the measurement results of the first measuring instrument and the second measuring instrument, whether a space, which is between the image plane side tip part of the projection optical system and an object opposing the tip part and includes at least an optical path of the exposure light, is filled with the liquid" either, and thus cannot make up for the deficiencies of Fukami with respect to claim 9.

The solenoid valve 22, moreover, controls the water flow into the drain pan 4. In particular, as described at column 10, lines 62-66:

Such disadvantages can be avoided or overcome by a controller 25 monitoring the outputs from the flow sensors 24 and 20, and controlling the solenoid valve 22 so that at least a certain quantity of water flows into the drain pan 4, and eventually into the trap 15.

Since the solenoid valve 22 of Hagiwara controls the water flow into the drain pan 4, Hagiwara has no "control apparatus that determines, based on the measurement results of the first measuring instrument and the second measuring instrument, whether a space, which is between the image plane side tip part of the projection optical system and an object opposing the tip part and includes at least an optical path of the exposure light, is filled with the liquid" either, and thus cannot make up for the deficiencies of Fukami with respect to claim 9.

Thus, even if Fukami and Hagiwara were combined as proposed in the Office Action, claim 9 would not result. Claim 9 is the submitted to be allowable, for at least those reasons discussed above with respect to the rejection of claim 1. Withdrawal of the rejection of claim 9 is earnestly solicited.

Claims 10, 11, and 12 depend from claim 9 and add further distinguishing elements. Claims 10, 11, and 12 are thus also submitted to be allowable. Withdrawal of the rejection of claims 10, 11, and 12 is earnestly solicited.

Claims 13, 14, and 15:

The fourth clause of claim 13 recites:

A measuring instrument that measures the amount of liquid recovered by the liquid recovery mechanism since the supply of the liquid by the liquid supply mechanism was stopped; and

Neither Fukami nor Hagiwara teaches, discloses, or suggests "a measuring instrument that measures the amount of liquid recovered by the liquid recovery mechanism since the supply of the liquid by the liquid supply mechanism was stopped," as recited in claim 13.

The Office Action acknowledges graciously in section 4, at page 7, that Fukami shows no "measuring instrument that measures the amount of liquid recovered by the liquid recovery mechanism since the supply of the liquid by the liquid supply mechanism was stopped," and attempts to compensate for this deficiency of Fukami by combining Fukami with Hagiwara.

Hagiwara, however, has no "measuring instrument that measures the amount of liquid recovered by the liquid recovery mechanism since the supply of the liquid by the liquid supply mechanism was stopped " either, and thus cannot make up for the deficiencies of Fukami with respect to claim 9 in any case. Hagiwara, rather, uses the timer to control the *rate* of flow, not to measure "the amount of liquid recovered by the liquid recovery mechanism since the supply of the liquid by the liquid supply mechanism was stopped," as discussed above with respect to the rejection of claim 1, while the solenoid valve 22 is for adjusting the supply flow rate of the pure water, as discussed above with respect to the rejection of claim 9.

The fifth clause of claim 13 recites:

A control apparatus that determines, based on the measurement result of the measuring instrument, whether the liquid has been recovered from the space.

Neither Fukami nor Hagiwara teaches, discloses, or suggests "a control apparatus that determines, based on the measurement result of the measuring instrument, whether the liquid has been recovered from the space," as discussed above with respect to the rejections of claims 1 and 9. Thus, even if Fukami and Hagiwara were combined as proposed in the Office Action, claim 13 would not result. Claim 13 is the submitted to be allowable, for at least those reasons

discussed above with respect to the rejections of claims 1 and 9. Withdrawal of the rejection of claim 13 is earnestly solicited.

Claims 14 and 15 depend from claim 13 and add further distinguishing elements. Claims 14 and 15 are thus also submitted to be allowable. Withdrawal of the rejection of claims 14 and 15 is earnestly solicited.

Claims 4 and 16-24:

Claims 4 and 16-24 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Fukami and Hagiwara in view of U.S. Patent Application Publication No. 2005/003769 to Levinson (hereinafter "Levinson"). The rejection is traversed. Reconsideration is earnestly solicited.

Claims 4 and 24 depend from claim 1 and add further distinguishing elements. Neither Fukami nor Hagiwara teaches, discloses, or suggests "a timer that measures the time that has elapsed since the supply of the liquid by the liquid supply mechanism was started," or determining "based on a measurement result of the timer, whether a space, which is between the image plane side tip part of the projection optical system and the object and includes at least an optical path of the exposure light, is filled with the liquid," as discussed above with respect to the rejection of claim 1. Levinson does not either, and thus cannot make up for the deficiencies of either Fukami or Hagiwara with respect to claims 4 and 24. Claims 4 and 24 are thus submitted to be allowable. Withdrawal of the rejection of claims 4 and 24 is earnestly solicited.

Claims 16, 18, and 22:

The third clause of claim 16 recites:

Measuring the time that has elapsed since the start of the supply.

Neither Fukami, Hagiwara, nor Levinson teaches, discloses, or suggests "measuring the time that has elapsed since the start of the supply," as discussed above with respect to the rejections of claims 1 and 4.

The fourth clause of claim 16 recites:

Determining that the space is filled with the liquid at a point in time when the elapsed time exceeds a prescribed time.

Neither Fukami, Hagiwara, nor Levinson teaches, discloses, or suggests "determining that the space is filled with the liquid at a point in time when the elapsed time exceeds a

prescribed time," as discussed above with respect to the rejections of claims 1 and 4. Thus, even if Fukami, Hagiwara, and Levinson were combined as proposed in the Office Action, claim 16 would not result. Claim 16 is thus submitted to be allowable. Withdrawal of the rejection of claim 16 is earnestly solicited.

Claims 18 and 22 depend from claim 16 and add further distinguishing elements. Claims 18 and 22 are thus also submitted to be allowable. Withdrawal of the rejection of claims 18 and 22 is earnestly solicited.

Claim 17:

The fourth clause of claim 17 recites:

Determining that the space is filled with the liquid at least one of the point in time when the difference between the amount supplied and the amount recovered has become less than a prescribed value, or the point in time when a prescribed time has elapsed since the difference between the amount supplied and the amount recovered became less than the prescribed value.

Neither Fukami, Hagiwara, nor Levinson teaches, discloses, or suggests "determining that the space is filled with the liquid at least one of the point in time when the difference between the amount supplied and the amount recovered has become less than a prescribed value, or the point in time when a prescribed time has elapsed since the difference between the amount supplied and the amount recovered became less than the prescribed value," as discussed above with respect to the rejection of claims 1 and 4. Claim 17 is the submitted to be allowable, for at least those reasons discussed above with respect to the rejection of claims 1 and 4. Withdrawal of the rejection of claim 17 is earnestly solicited.

Claims 19, 21, and 23:

The fourth clause of claim 19 recites:

Determining that the recovery of the liquid that filled the space is complete at the point in time when the elapsed time exceeds a prescribed time.

Neither Fukami, Hagiwara, nor Levinson teaches, discloses, or suggests "determining that the recovery of the liquid that filled the space is complete at the point in time when the elapsed time exceeds a prescribed time," as discussed above with respect to the rejections of claims 1 and 4.

The fifth clause of claim 19 recites:

Measuring the time that has elapsed since the stopping.

Neither Fukami, Hagiwara, nor Levinson teaches, discloses, or suggests "measuring the time that has elapsed since the stopping," as discussed above with respect to the rejections of claims 1 and 4. Claim 19 is submitted to be allowable, for at least those reasons discussed above with respect to the rejection of claims 1 and 4. Withdrawal of the rejection of claim 19 is earnestly solicited.

Claims 21 and 23 depend from claim 19 and add further distinguishing elements. Claims 21 and 23 are thus also submitted to be allowable. Withdrawal of the rejection of claims 21 and 23 is earnestly solicited.

Claim 20:

The last clause of claim 20 recites:

Determining that the recovery of the liquid that fills the space is complete at least one of the point in time when the amount recovered has become less than a prescribed amount, or the point in time when a prescribed time has elapsed since the amount recovered became less than a prescribed value.

Neither Fukami, Hagiwara, nor Levinson teaches, discloses, or suggests "determining that the recovery of the liquid that fills the space is complete at least one of the point in time when the amount recovered has become less than a prescribed amount, or the point in time when a prescribed time has elapsed since the amount recovered became less than a prescribed value," as discussed above with respect to the rejection of claims 1 and 4. Claim 20 is submitted to be allowable, for at least those reasons discussed above with respect to the rejection of claims 1 and 4. Withdrawal of the rejection of claim 20 is earnestly solicited.

New claims 25-29:

New claims 25-29 depend from claim 1 or claim 13 and add further distinguishing elements. Claims 25-29 are thus believed to be allowable as well.

Conclusion:

Accordingly, in view of the reasons given above, it is submitted that all of claims 1-29 are allowable over the cited references. Allowance of all claims 1-29 and of this entire application is therefore respectfully requested.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

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If there are any additional fees associated with filing this Amendment, please charge them to our Deposit Account No. 19-3935.

Respectfully submitted,

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